Claims

1. Microscope arrangement, comprising
- an illumination source (1), optical components for generating an illumination beam path, a lens (21) through which the illumination beam path is directed onto a sample (20) which is present in the object plane of the lens (21) or in the proximity thereof, as well as
- optical components for generating an imaging beam path directed onto the receiving surface of a camera (22), characterized in that a homogenizing unit (5) for homogenizing the intensity of the illumination light that is incident on the sample section to be examined is present.

2. The microscope arrangement as recited in Claim 1, characterized in that the homogenization unit (5) is formed as a fiber-optic waveguide with a receiving surface (8) facing the illumination source (1) and a emitting surface (9) the illumination light facing away from the lens (21).

3. The microscope arrangement as recited in Claim 2, characterized in that the fiber-optic waveguide is designed as an internally reflective hollow rod, as an internally totally reflective, transparent solid rod, as a liquid fiber-optic waveguide or in the form of a bundle of glass fibers (26).

4. The microscope arrangement as recited in Claim 2 or 3, characterized in that the optically active cross-section of the fiber-optic waveguide is formed to be circular, square or rectangular.

5. The microscope arrangement as recited in one of Claims 2 to 4, characterized in that the receiving and/or emitting surface (8, 9) of the homogenization unit (5) is provided with a microlens structure, a plurality of round, square, honeycomb-shaped or cylindrical micro-lenses, each having a line radius of approximately 100 µm to 1000 µm, being disposed adjacent to one another.

6. The microscope arrangement as recited in Claim 1, characterized in that

- two optical components (27, 28, arranged in sequence in the illumination beam path and structured with micro-cylinder lenses, are provided as the homogenization unit (5), wherein
- the longitudinal directions of the micro-cylinder lenses on both components (27, 28) are oriented to be perpendicular to the optical axis (2) of the illumination beam path, and wherein
- the longitudinal direction of the micro-cylinder lenses on one component (27) and the longitudinal direction of the micro-cylinder lenses on the other component (28) enclose an angle of 90°.

7. The microscope arrangement as recited in one of the preceding claims, characterized in that means of imaging the emitting surface (9) in the field aperture plane (10) as well as means of imaging the field aperture plane (10) in the lens plane are provided.

8. The microscope arrangement as recited in one of the preceding claims, characterized in that the optically active surface of a field aperture (11) disposed in the field aperture plane (10) is structured to be strip-like or chessboard-like, wherein transparent and non-transparent partial surfaces alternate in the structure.

9. The microscope arrangement as recited in Claim 8, characterized in that a controllable shutter (12) for darkening selected surface sections of the field aperture (11) is disposed in front of the field aperture (11).

10. The microscope arrangement as recited in Claim 8 or 9, characterized in that
- a partially permeable diversion mirror (14) is disposed downstream from the field aperture (11) in the illumination beam path,
- of which the predominant portion of the illumination light is guided through an illumination tube (15) that parallelizes the illumination beam path, and
- through a first spectral filter (18) for selection of a fraction of the illumination light intended for excitation
- onto a color splitter, preferably a dichroitic mirror, or a partially transparent mirror, and
- is guided by its splitter surface (19) through the lens (21) and onto the sample (20).

11. The microscope arrangement as recited in Claim 10, characterized in that
- the fluorescent light emitted by the sample (20) passes back through the lens (21),
- passes through the splitter surface (19) of the color splitter or partially transparent mirror and,
- subsequently through a second spectral filter (23), which is permeable for the emission light, and reaches
- the camera (22) through an imaging tube (24).

12. The microscope arrangement as recited in Claim 10 or 11, characterized in that the illumination tube (15) and the imaging tube (24) are formed from identical optical components.

13. The microscope arrangement as recited in one of the preceding claims, characterized in that a removable equalizing glass is disposed in front of the lens (21), as a result of which measurements of the sample (20) can be taken with the equalizing glass, on an air/solid object contact surface of the sample (20) facing the lens (21) or, without the equalizing glass, through a transparent sample carrier.

14. The microscope arrangement as recited in one of the preceding claims, characterized in that a fraction of the illumination light passing through the partially transparent diversion mirror (14) is directed onto a monitor detector (16), which serves to monitor the intensity of the illumination light.

15. The microscope arrangement as recited in one of Claims 10 to 14, characterized in that the planar normals of the spectral filters (18, 23) and the optical axis (2) of the illumination beam path and/or the optical axis (42) of the imaging beam path enclose an angle in the range of 1° to 20°, preferably 5°.

16. The microscope arrangement as recited in one of Claims 10 to 15, characterized in that the spectral filter (18) in the illumination beam path and the spectral filter (23) in the emission beam path, together with the color splitter and/or the partially permeable mirror, are structured as a filter cube (17).

17. The microscope arrangement as recited in Claim 16, characterized in that the filter cube (17) is disposed with at least one additional filter cube, which differs from the first filter cube (17)

with respect to its configuration for the excitation and emission wavelengths of the illumination light , on a changing device, preferably a change wheel.

18. The microscope arrangement as recited in one of the preceding claims, characterized in that a grayscale filter (3) pivots in the illumination beam path against the optical axis (2) of said illumination beam path, wherein the planar normal on the incident light surface (7) of the grayscale filter (3) and the optical axis (2) of the illumination beam path enclose an angle in the range of 5° to 15°.

19. The microscope arrangement as recited in one of the preceding claims, characterized in that the illumination source (1) is connected to the remaining components of the microscope arrangement by a detachable mechanical connection.

20. The microscope arrangement as recited in one of the preceding claims, characterized in that the lens (21) is arranged to be displaceable on a slide bar (34) in parallel to its optical axis and, for this purpose, is coupled with a motor-driven adjustment device.

21. The microscope arrangement as recited in one of the preceding claims, characterized in that the lens (21) and at least one other lens, which differs from the first lens (21) with respect to its optical properties, are disposed on a changing device, preferably a lens revolver.

22. The microscope arrangement as recited in one of the preceding claims, characterized in that
- an autofocusing device is provided that comprises an autofocus laser (29), an autofocus sensor (32) and an autofocus actuating mechanism, as well as
- means of bundling an autofocus laser beam (31) in the illumination beam path.

23. The microscope arrangement as recited in one of the preceding claims, characterized in that a CCD or CMOS camera is provided as the camera (22).

24. The microscope arrangement as recited in one of the preceding claims, characterized in that the optical axis of the lens (21) is oriented to be perpendicular to the direction of gravity.

25. The microscope arrangement as recited in one of the preceding claims, characterized in that a sample table (38) adjustable in coordinate directions X and/or Y perpendicular to the optical axis of the lens (21) is provided to support the sample (20), wherein coordinate direction Y progresses in parallel to the direction of gravity.

26. The microscope arrangement as recited in Claim 25, characterized in that the sample table (38) is coupled to a piezo drive and/or a spindle drive, wherein the piezo drive is preferably provided for adjustment in coordinate direction X and the spindle drive for adjustment in coordinate direction Y.

27. The microscope arrangement as recited in Claim 25 or 26, characterized in that the sample table (38) is connected with a leveling device (41), which is used to adjust the incline of the sample surface relative to the optical axis of the lens (21).

28. The microscope arrangement as recited in one of Claims 25 to 27, characterized in that the sample (20) is arranged on the sample table (38) by means of a sample holder, the sample holder and the sample table (38) being detachably connected to one another.

[several pages of drawings]

Ansicht = View